CanadianSolar

DIAMOND MODULE INSTALLATION MANUAL

For professional use only

1.0
GENERAL INFORMATION

This general manual provides important safety information relating to the installation, maintenance and handling of double glass solar modules. Professional installer must read these guidelines carefully and strictly follow these instructions. Failure to follow these instructions may result in death, injury or property damage. The installation and handling of PV modules requires professional skills and should only be performed by qualified professionals. The installers must inform end -users (consumers) the aforesaid information accordingly. The word "module" or "PV module" used in this manual refers to one or more CS-series solar modules. Please retain this manual for future reference. We recommend checking **www.canadiansolar.com** regularly for the most updated version.

1.1
INSTALLATION MANUAL DISCLAIMER

The information contained in this manual is subject to change by Canadian Solar Inc. without prior notice. Canadian Solar Inc. gives no warranty of any kind whatsoever, either explicitly or implicitly, with respect to the information contained herein.

1.2
LIMITATION OF LIABILITY

Canadian Solar Inc. shall not be held responsible for damages of any kind, including – without limitation – bodily harm, injury or damage to property, in connection with handling PV modules, system installation, or compliance or non-compliance with the instructions set forth in this manual.

2.0
SAFETY PRECAUTIONS

Warning: Before attempting to install, wire, operate and/or service the module and other electrical equipment, all instructions should be read and understood.

PV module interconnectors pass direct current (DC) when exposed to sunlight or other light sources. Contact with electrically active parts of the module, such as terminals, can result in injury or death, irrespective of whether or not the module and the other electrical equipment have been connected.

GENERAL SAFETY

- All modules must be installed by licensed electricians in accordance with the applicable electrical codes such as, the latest National Electrical Code (USA) or Canadian Electric Code (Canada), or other national or international electrical codes.

Protective clothing (non-slip gloves, clothes, etc.) must be worn during installation to prevent direct contact with 30 VDC or greater, and to protect your hands from sharp edges.

Prior to installation, remove all metallic jewelry to prevent accidental exposure to live circuits.

When installing or handling modules in light rain, morning dew or strong wind, appropriate safety measures should be taken to avoid damaging the modules or injuring people.

Do not allow children and unauthorized persons near the installation site or storage area of modules.

- If the disconnects and OCPDs cannot be opened or the inverter cannot be powered down, cover the fronts of modules in the PV array with an opaque material to stop the production of electricity when installing or working on a module or wiring.
- Use electrically insulated tools to reduce the risk of electric shock.
- **Do not** use or install broken modules.
- Contact with module surfaces or frames may cause electric shock if the front or rear glasses are broken.
- Keep the junction box cover closed at all times.
- **Do not** connect or disconnect modules when current from the modules or an external source is present.
- **Do not** disassemble a module or remove any module part.

- **Do not** artificially concentrate sunlight onto a module.
- The PV module does not contain any serviceable parts. Do not attempt to repair any part of the module.

3.0 MECHANICAL / ELECTRICAL SPECIFICATIONS

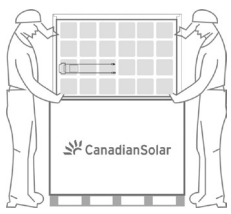
Module electrical ratings are measured under Standard Test Conditions (STC) of 1 kW/m^2 irradiance, with an AM 1.5 spectrum, and a cell temperature of 25°C. Detailed electrical and mechanical characteristics of Canadian Solar Inc. crystalline silicon PV modules can be found in Annex A (Module Specification) on **www.canadiansolar.com.** Main electrical characteristics under STC are also stated on each module label. The maximum system voltage for module type is 1000 V (UL) and 1500 V (IEC).

Under certain conditions, a module may produce more current or voltage than its STC rated power. As a result, a module open-circuit voltage and short-circuit current under STC should be multiplied by 1.25 when determining component voltage ratings, conductor ampacities, overcurrent device ratings, and the size of controls connected to the PV output. An additional 1.25 multiplier for the short-circuit current (giving a total multiplier of 1.56), may be applicable when sizing conductors and fuses, as described in section 690-8 of U.S. NEC.

4.0 UNPACKING AND STORAGE

PRECAUTIONS

- Module should be stored in dry and ventilated environment to avoid direct sunlight and moisture.
- Modules must always be unpacked by two people. When handling modules always use both hands.



- Unpack module pallets carefully, following the steps shown on the pallet. Unpack, transport and store the modules with care.
- **Do not** lift modules by their wires or junction box; lift them by the frame.
- **Do not** place modules on top of each other.
- **Do not** place excessive loads on the module or twist the module frame.
- **Do not** stand, step, walk and/or jump on modules.

- **Do not** drop or place objects (such as tools) on the modules.
- **Do not** carry modules on your head.
- **Do not** use sharp instruments on the modules.
- **Do not** place modules on top of each other
- **Do not** leave modules unsupported or unsecured.
- **Do not** change the wiring of bypass diodes.
- Keep all electrical contacts clean and dry.

PRODUCT IDENTIFICATION

- Each module is equipped with two identical barcodes (one inside the laminate under the front glass, the second on the rear side of the module) that act as a unique identifier. Each module has a unique serial number containing 14 digits.
- A nameplate is also affixed to the rear glass of each module. This nameplate specifies the model type, as well as the main electrical and safety characteristics of the module.

5.0
MODULE INSTALLATION

PRECAUTIONARY MEASURES AND GENERAL SAFETY

- Prior to installing modules please obtain information about any requirements and necessary approvals for the site, installation and inspection from the relevant authorities.

- Check applicable building codes to ensure that the construction or structure (roof, facade, support, etc.) can bear the module system load.

- CS6K-P-PG solar modules have been qualified for Application Class A (equivalent to Safety Class II requirements). Modules rated under this class should be used in systems operating at voltage above 50 V or power above 240 W, where general contact access is anticipated.

Please note **DO NOT STAND OR STEP** on the modules under any circumstances. Localized heavy loads may cause severe micro-cracks at cell level, which in turn may compromise module reliability. Failure to comply with the above caution will void Canadian Solar Inc.'s warranty.

SYSTEM FIRE RATING

- The fire rating for this module is only valid when the product is installed as specified in the mechanical mounting instructions.

- Canadian Solar Inc. CS6K-P-PG modules have been certified by CSA as Type 3 for fire performance.

- When installing the modules on rooftop, please ensure the assembly is mounted over a fire resistant roof covering rated for the application.

- A photovoltaic system composed of UL1703 certified modules mounted on a UL2703 certified mounting system should be evaluated in combination with roof coverings in accordance with UL1703 standard, with respect to meeting the same fire classification as the roof assembly.

- Mounting systems with a System Fire Class Rating (Class A, B or C), tested in conjunction with fire rated "Type 3" rated modules, are considered acceptable for use with Canadian Solar Inc. modules, provides the mounting system does not violate any other requirements of this manual.

- Any mounting system limitations on inclination or accessories required to maintain a specific System Fire Class Rating should be clearly specified in the installation instructions and UL2703 certification of the mounting system supplier.

ENVIRONMENTAL CONDITIONS

- The module is intended for use in general open-air climates, as defined in IEC 60721-2-1: Classification of environmental conditions Part 2-1: Environmental conditions appearing in nature. Temperature and humidity.

- Please consult the Canadian Solar Inc. technical support department for more information on the use of modules in special climates.

Do not install modules near naked flames or flammable materials.

Do not immerse modules in water or constantly expose modules to water (either fresh or salt) (i.e. from fountains, sea spray).

- Exposing modules to salt (i.e. marine environments) or sulfur (i.e. sulfur sources, volcanoes) incurs the risk of module corrosion.

- Failure to comply with these instructions will void Canadian Solar Inc. warranty.

INSTALLATION REQUIREMENTS

- Ensure that the module meets the general technical system requirements. Ensure that other systems components do not damage modules mechanically or electrically.

- Modules can be wired in series to increase voltage or in parallel to increase current. To connect modules in series, connect the cables from the positive terminal of one module to the negative terminal of the next module. To connect in parallel, connect the cables from the positive terminal of one

module to the positive terminal on the next module.

- Only connect the quantity of modules that corresponds to the voltage specifications of the inverters used in the system. Modules must **not** be connected together to create a voltage higher than the maximum permitted system voltage, even under the worst local temperature conditions.

- Only modules with similar electrical outputs should be connected in the same series to avoid or minimize mismatch effects in arrays.

- To minimize risk in the event of an indirect lightning strike, avoid forming loops when designing the system.

- The recommended maximum series fuse rating is stated in a table in the Annex.

- Modules should be safely fixed to bear all expected loads, including wind and snow loads. A minimum clearance of 0.255 in (6.5 mm) or more between modules is required to allow for thermal expansion of the metal frames.

OPTIMUM ORIENTATION AND TILT

- To maximize your annual yield, find out the optimum orientation and tilt for PV modules in your region. The highest yields are achieved when sunlight shines perpendicularly onto the PV modules.

AVOID SHADING

- Even minor partial shading (e.g. from dirt deposits) reduces yields. A module can be considered to be unshaded if its entire surface is free from shading all year round. Sunlight should be able to reach the module even on the shortest day of the year.

RELIABLE VENTILATION

- Sufficient clearance (at least 3.94 in (10 cm)) between the module frame and the mounting surface is required to allow cooling air to circulate around the back of the module. This also enables condensation or moisture to dissipate.

- Any other specific clearance required for maintaining a system fire rating should prevail. Detailed clearance requirements pertaining to system fire ratings must be provided by your racking supplier.

5.1 MODULE WIRING

CORRECT WIRING SCHEME

- Ensure that the wiring is correct before starting up the system. If the measured open circuit voltage (Voc) and short-circuit current (Isc) differ from the specifications, this indicates that there is a wiring fault.

CORRECT CONNECTION OF PLUG CONNECTORS

- Make sure that connections are safe and tight. Plug connector should not be subjected to stress from the exterior. Connectors should only be used to connect the circuit. They should never be used to turn the circuit on and off.

USE OF SUITABLE MATERIALS

- Only use dedicated solar cable and suitable plugs (wiring should be sheathed in a sunlight-resistant conduit or, if exposed, should itself be sunlight-resistant) that meet local fire, building and electrical regulations. Please ensure that all wiring is in perfect electrical and mechanical condition.

- Installers may only use 4 mm^2 (12 AWG) single conductor cable listed and labeled as PV Wire or TUV 2PfG1169 approved, that is 90°C wet rated with proper insulation that is able to withstand the maximum possible system open-circuit voltage. Only copper conductor material should be used. Select a suitable conductor gauge to minimize voltage drop and ensure that the conductor ampacity complies with local regulations (i.e. NEC 690.8(D)).

CABLE PROTECTION

- Secure the cables to the mounting system using UV-resistant cable ties. Protect exposed cables from damage by taking appropriate precautions

(e.g. placing them inside a plastic conduit). Avoid exposure to direct sunlight.

· A minimum bending radius of 60 mm is required when securing the junction box cables to the racking system.

CONNECTOR PROTECTION

· Protect exposed connectors from weathering damage by taking appropriate precautions. Avoid exposure to direct sunlight.

5.2 MODULE GROUNDING

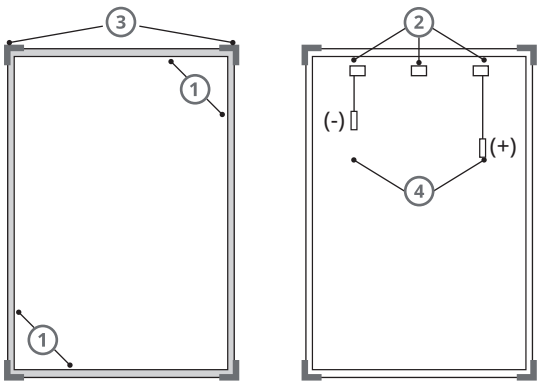
· EQUIPMENT GROUNDING: double glass modules do not present any exposed conductive parts, and so do not require to be electrically grounded for compliance to the National Electrical Code.

· Proper equipment grounding is still required for the racking system in compliance with all local electrical codes and regulations. Please refer to the racking system user instructions.

6.0 MOUNTING INSTRUCTIONS

STANDARD MODULES

For a clear understanding of our modules, please refer to the illustration of a module shown below:



① Module frame
② Junction box
③ Plastic corners
④ Cables and connectors

Please note

1. The lengths of the cables are 13.8 in (350 mm) (-) and 19.7 in (500 mm) (+) for portrait installation.

2. The optional lengths of the cables are 39.4 in (1000 mm) (-/+) for landscape installation

The applicable regulations pertaining to work safety, accident prevention and securing the construction site must be observed. Persons and objects have to be secured against falling. Any third parties need to be protected against injuries and damages.

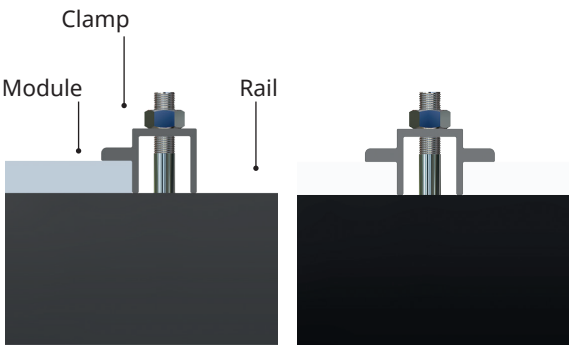
CS6K-P-PG MODULES

· The mounting design must be certified by a registered professional engineer. The mounting design and procedures must comply with local codes and requirements from all relevant authorities.

· The module is only considered to comply with UL1703 when mounted as specified in the instructions below.

· CS6K-P-PG modules can be mounted to a support structure by means of clamps only (see Example). For other installation hardware, please contact your local representative for further information. Failure to use a recognized installation method will void Canadian Solar Inc. warranty.

Example: Clamping on



Edge clamp Middle clamp

· Use appropriate corrosion-proof fastening materials. All mounting hardware (bolts, spring washers, flat

washers, nuts) should be made with stainless steel.

Please note **Do not** modify the module frame. Doing so will void the warranty.

- Any module without a frame (laminate) shall not be considered to comply with the requirements of UL 1703 unless the module is mounted with hardware that has been tested and evaluated with the module under this standard or by a field Inspection certifying that the installed module complies with the requirements of UL 1703.

- Canadian Solar Inc. recommends mounting rails with a minimum width of 60 mm.

6.1 RECOMMENDED METHOD: CLAMPING

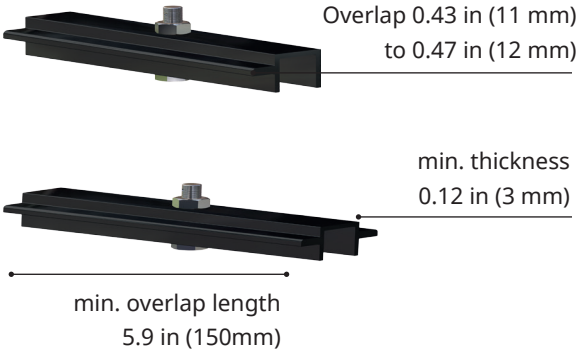
- The mounting method has been qualified by Canadian Solar Inc. and certified by VDE and CSA.

- Top clamping methods will vary and are dependent on the mounting structures. For other clamp designs, please contact your local representative for approval.

- Each module must be securely fastened at a minimum of 4 points on two opposite sides. The clamps should be positioned according to the authorized position ranges defined in table 3. Install and tighten the module clamps to the mounting rails using the torque stated by the mounting hardware manufacturer. System designer and installer are responsible for load calculations and for proper design of support structure.

- Use a torque wrench for installation. Tightening torques should respectively be within 20~ 26 Nm (14.8~19.2 ft-lb) (23 Nm (17.0 ft-lb) is recommend) for M8 × 1.25 coarse thread bolts, depending on bolt class

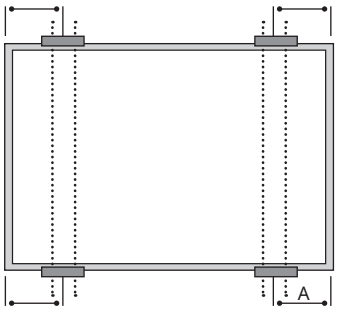
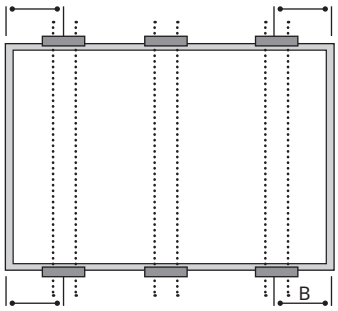
- Canadian Solar Inc. warranty may be void in cases where improper clamps or unsuitable installation methods are found. When installing middle or end clamps, take measures so as:
  1. Not to bend the laminate excessively
  2. Not to cast shadow on the cells
  3. Not to damage or scratch the surface of the glass



- Clamp material should be anodized aluminum alloy or steel of appropriate grade. Floating type clamps are not authorized.

- Clamp positions are of crucial importance for the reliability of the installation, the clamp centerlines must only be positioned within the ranges indicated in table 3, depending on the configuration and load.

Table 3:
Authorized attachements for clamping method

	Uplift load ≤ 2400 Pa **Downforce load ≤ 2400 Pa**	**Uplift load ≤ 2400 Pa** **2400 Pa ≤ Downforce load ≤ 5400 Pa**
Clamping on long side frame (for CS6K-P-PG)	Use 4 clamps on the long side.  Mounting rails must run perpendicularly to the long side frame.	Use 6 clamps on the long side (2 clamps on the middle of the long side).  Mounting rails must run perpendicularly to the long side frame.
	Authorized range for clamping	
	A range (mm) **420 ± 20**	**B range (mm)** **275 ± 20**

7.0 MAINTENANCE

- Regular maintenance is required to keep modules clear of snow, bird droppings, seeds, pollen, leaves, branches, dirt spots, and dust.
- Modules with sufficient tilt (at least 15°), generally **do not** require cleaning (rain will have a self-cleaning effect). If the module has become soiled, it shall be washed with water and a non-abrasive cleaning implement (sponge) during the cool part of the day. **Do not** scrape or rub dry dirt away, as this may cause micro scratches.
- Snow should be removed using a soft brush.
- The system shall be periodically inspected to verify the integrity of all wiring and supports.
- To protect against electric shock or injury, electrical or mechanical inspections and maintenance should be performed by qualified personnel only and on a regular basis.
- **Do not** make modifications to the PV components (diode, junction box, plug connectors).
- Please refer to our Installation Manual Annex (Section Annext D: Module Cleaning Guideline) for more information on module cleaning.

AMENDED EDITIONS AND DATES

- The first edition Rev 1.0 is released in Dec. 2014.
- The second edition Rev 1.1 is released in Feb. 2015.

ANNEX A:
MODULE SPECTIFICATION

Standard Test Conditions are: irradiance of 1 kW/m^2, AM 1.5 spectrum, and cell temperature of 25°C. The electrical characteristics are respectively within ±10 percent or [0; +5 W] of the indicated values for Isc, Voc and Pmax. Specifications are subject to change without notice.

Table 4:
Specifications for CS6K-P-PG photovoltaic modules under STC

Module Type	Maximum Power Pmax <W>	Operating voltage Vmp <V>	Operating current Imp <A>	Open Circuit Voltage Voc <V>	Short Circuit Current Isc <A>	Max. Series Fuse Rating <A>	Overall Dimension <mm>	Weight <kg>
CS6K-245P-PG	245	30.0	8.17	37.1	8.70	15	1650 × 992 × 28.7	23
CS6K-250P-PG	250	30.1	8.30	37.2	8.83			
CS6K-255P-PG	255	30.2	8.44	37.3	8.99			
CS6K-260P-PG	260	30.4	8.56	37.5	9.12			
CS6K-265P-PG	265	30.6	8.66	37.7	9.23			
CS6K-270P-PG	270	30.8	8.75	37.9	9.32			
CS6K-275P-PG	275	31.0	8.88	38.0	9.45			
CS6K-280P-PG	280	31.3	8.95	38.2	9.52			

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